

Status of the Claims

1. (Withdrawn) A valve system, comprising:

 a valve comprising a valve stem linearly movable between a first closed

5 position and a second, open position;

 a first spring;

 a second spring;

 a first electromagnet assembly;

 a second electromagnet assembly; and

10 a permanent magnet clapper affixed to the valve stem;

 whereby the first spring is compressed and the valve is moved toward the

first closed position as the permanent magnet approaches the first
electromagnetic assembly, and whereby the second spring is compressed and
the valve is moved toward the second open position as the permanent magnet

15 approaches the second electromagnetic assembly.

2. (Withdrawn) The valve system of Claim 1, further comprising:

 means for providing energy to at least one of the electromagnet
assemblies to increase a local magnetic field.

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3. (Withdrawn) The valve system of Claim 1, further comprising:

 means for providing energy to at least one of the electromagnet
assemblies to decrease a local magnetic field.

25 4. (Withdrawn) The valve system of Claim 1, further comprising:

 means for providing energy to at least one of the electromagnet
assemblies to attract the permanent magnet.

5. (Withdrawn) The valve system of Claim 1, further comprising:

30 means for providing energy to at least one of the electromagnets to repel
the permanent magnet.

6. (Withdrawn) The valve system of Claim 1, further comprising:

means for repelling and attracting said clapper as needed to allow said valve to be opened and/or closed more quickly than a natural frequency of a spring mass combination would perform while still obtaining a soft landing.

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7. (Withdrawn) The valve system of Claim 1, further comprising:

means for feedback control of valve motion to allow for compensation of friction, pressure forces, and other forces.

10 8. (Withdrawn) The valve system of Claim 1, further comprising:

means for energy recovery during deceleration of said valve.

9. (Withdrawn) The valve system of Claim 1, wherein overall power consumption is low because no power is required to hold said valve open or

15 closed.

10. (Withdrawn) The valve system of Claim 1, further comprising:

means for storing energy recovered from at least one of the electromagnet assemblies.

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11. (Withdrawn) The valve system of Claim 1, wherein the permanent magnet comprises neodymium.

12. (Withdrawn) The valve system of Claim 1, wherein the permanent magnet

25 comprises samarium cobalt.

13. (Withdrawn) The valve system of Claim 1, wherein said first spring is isolated from said valve at the first closed position, and wherein said second spring is isolated from said valve at the second open position.

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14. (Withdrawn) A valve system, comprising:

a valve assembly linearly movable between a closed position and an open position;

5 a valve spring which is compressed by the valve assembly when the valve assembly is located in the open position, and is uncompressed when the valve assembly is located in the closed position;

a disable spring which is compressed by the valve assembly when the valve assembly is located in the closed position, and is uncompressed when the valve assembly is located in the open position;

10 a first electromagnet and a second electromagnet;

a first permanent magnet located proximate to the first electromagnet;

a second permanent magnet located proximate to the second electromagnet; and

15 a clapper affixed to the valve assembly, such that the clapper moves between the first electromagnet and the second electromagnet.

15. (Withdrawn) The valve system of Claim 14, further comprising:

means for providing energy to at least one of the electromagnets to increase a local magnetic field.

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16. (Withdrawn) The valve system of Claim 14, further comprising:

means for providing energy to at least one of the electromagnets to decrease a local magnetic field.

25 17. (Withdrawn) The valve system of Claim 14, further comprising:

means for providing energy to at least one of the electromagnets to attract the clapper.

18. (Withdrawn) The valve system of Claim 14, further comprising:

30 means for providing energy to at least one of the electromagnets to repel the clapper, when said clapper comprises a permanent magnet.

19. (Withdrawn) The valve system of Claim 14, further comprising:

means for storing energy recovered from at least one of the electromagnets.

5 20. (Withdrawn) The valve system of Claim 14, wherein the permanent magnet comprises neodymium.

21. (Withdrawn) The valve system of Claim 14, wherein the permanent magnet comprises samarium cobalt.

10 22. (Withdrawn) The valve system of Claim 14, wherein the valve spring is isolated from the valve at the closed position, and wherein the disable spring is isolated from the valve at the open position.

15 23. (Currently Amended) A valve system, comprising:

a valve assembly linearly movable between a closed position and an open position;

a valve spring which is compressed by the valve assembly when the valve assembly is located in the open position, and is uncompressed when the valve assembly is located in the closed position;

a disable spring which is compressed by the valve assembly when the valve assembly is located in the closed position, and is uncompressed when the valve assembly is located in the open position;

at least one electromagnet;

25 at least one permanent magnet having a magnetic field; and

a clapper affixed to the valve assembly and movable in relation to the electromagnet and the permanent magnet; and

means for providing energy to each of at least one of the electromagnets for any of attracting the clapper and repelling the clapper;

30 wherein the magnetic field from at least one of the permanent magnets provides an attractive latching force to the clapper when the valve assembly is in any of the closed position and the open position; and

wherein the energy means provides energy to decrease a local magnetic flux to repel the clapper and provide a soft landing at any of the closed position and the open position.

5 24. (Currently Amended) The valve system of Claim 23, ~~further comprising:~~
wherein the means for providing energy to at least one of the electromagnets is controllable to increase a local magnetic field.

25. (Currently Amended) The valve system of Claim 23, ~~further comprising:~~
~~wherein the~~ means for providing energy to at least one of the electromagnets is controllable to decrease a local magnetic field.

5 26. (Currently Amended) The valve system of Claim 23, ~~further comprising:~~
~~wherein the energy~~ means for providing is controllable to provide energy to at least one a single of the electromagnets to attract for both attracting the clapper and repelling the clapper during a single movement toward any of the closed position and the open position.

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27. (Currently Amended) The valve system of Claim 23, ~~further comprising:~~
~~wherein the at least one means for providing energy to at least one of the electromagnets is controllable to repel the clapper, wherein said clapper comprises a permanent magnet~~ comprises a single permanent magnet that provides the attractive latching force to the clapper when the valve assembly is in any of the closed position and the open position.

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28. (Withdrawn) The valve system of Claim 23, further comprising:
means for storing energy recovered from at least one of the electromagnets.

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29. (Original) The valve system of Claim 23, wherein the permanent magnet comprises neodymium.

25 30. (Original) The valve system of Claim 23, wherein the permanent magnet comprises samarium cobalt.

31. (Original) The valve system of Claim 23, wherein the valve spring is isolated from the valve at the closed position, and wherein the disable spring is isolated from the valve at the open position.

32. (Withdrawn) The valve system of Claim 23, wherein energy is returned to a power source by use of regenerative breaking of said the clapper.

33. (Currently Amended) The valve system of Claim 23, wherein both a north 5 pole of said the permanent magnet and a south pole of said the permanent magnet are used to attract or repel said the electromagnet.

34. (Withdrawn) The valve system of Claim 23, further comprising:
10 a ~~software module~~ controller for at least partially controlling a soft landing and optionally for reducing power consumption.

35. (Withdrawn) The valve system of Claim 23, further comprising:
means to open said the valve partially and close it again.

15 36. (Currently Amended) The valve system of Claim of Claim 23, wherein the valve spring and the disable spring each have a different rate of compression.

37. (Original) The valve system of Claim 23, further comprising:
20 an electromagnet core.

38. (Currently Amended) The valve system of Claim 37, wherein said the core is formed as a laminated structure.

25 39. (Currently Amended) The valve system of Claim 37, wherein said the clapper is formed as a spiral laminate structure.

40. (Original) The valve system of Claim 23, wherein the valve spring and the disable spring have different lengths.

30 41. (Original) The valve system of Claim 23, wherein the valve spring and the disable spring have different masses.